Designation: D6634/D6634M – 14

Standard Guide for Selection of Purging and Sampling Devices for Groundwater Monitoring Wells[1]

This standard is issued under the fixed designation D6634/D6634M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This guide describes the characteristics and operating principles of purging and sampling devices available for use in groundwater monitoring wells and provides criteria for selecting appropriate devices for specific applications. The selected device(s) should be capable of purging the well and providing valid representative samples of groundwater and included dissolved constituents. The scope does not include procedures for purging or collecting samples from monitoring wells, sampling devices for non-aqueous phase liquids, diffusion-type sampling devices or sampling from devices other than monitoring wells.

1.2 This guide reviews many of the most commonly used devices for purging and sampling groundwater monitoring wells. The practitioner should ensure that the purging and sampling methods used, whether or not they are addressed in this guide, are adequate to satisfy the monitoring objectives at each site.

1.3 This guide offers an organized collection of information or a series of options and does not recommend a specific course of action. This guide cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this guide may be applicable in all circumstances. This ASTM guide is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of the many unique aspects of a project. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard. Dimensions provided are typical.

1.5 *This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D653 Terminology Relating to Soil, Rock, and Contained Fluids

D3740 Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

D5088 Practice for Decontamination of Field Equipment Used at Waste Sites

D6452 Guide for Purging Methods for Wells Used for Groundwater Quality Investigations

3. Terminology

3.1 *Definitions:* For definitions of general terms used within this guide, refer to Terminology D653.

4. Summary of Guide

4.1 The primary objective of groundwater sampling programs is to obtain samples that are representative of existing groundwater conditions retaining the physical and chemical properties of the groundwater in a specific water-bearing zone.[3] Depending on the purging and sampling protocol, this may require that the well is purged of stagnant water, or until

[1] This guide is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.21 on Groundwater and Vadose Zone Investigations.

Current edition approved Feb. 1, 2014. Published February 2014. Originally approved in 2001. Last previous edition approved in 2006 as D6634 – 01 (2006). DOI: 10.1520/D6634_D6634M-14.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] For example, the plasticizers in flexible PVC can contaminate samples with phthalate esters. The use of silicone rubber tubing, which contains no plasticizers, can obviate this problem; however, the potential for sample bias due to sorption/desorption exists with both materials (**1**). These pumps can be used with the intermediate vessel system described above, so that the sample contacts only the intake tubing and vessel avoiding contact with the pump mechanism tubing. Alternatively, using silicone rubber tubing at the pump head only can minimize this problem (**2, 3**).

***A Summary of Changes section appears at the end of this standard**

pre-determined purging criteria are met. Therefore, device(s) selected for use in groundwater sampling programs must be capable of purging the well as needed or delivering to the surface, or both, a sample representative of in-situ groundwater conditions. A number of factors can influence whether or not a particular sample or set of samples is representative, and one of the significant elements of sample collection protocols is the sampling mechanism (**4**, **5**, **6**).[4]

4.2 In selecting a purging or sampling device, or both, for use in a groundwater monitoring well, a number of factors must be considered. Among these are *1*) outside diameter of the device; *2*) materials from which the device and associated equipment are made; *3*) overall impact of the device on groundwater sample integrity with respect to the analytes of interest; *4*) ability to regulate the discharge rate of the device; *5*) depth to water; *6*) ease of operation and servicing; *7*) reliability and durability of the device; *8*) portability of the device and any needed accessory equipment, if applicable; *9*) other operational limitations of the device; and *10*) initial and operating cost of the device and accessory equipment. Based on these considerations, each of the devices available for purging or sampling groundwater, or both, from monitoring wells has its own unique set of advantages and limitations.

NOTE 1—The quality of the result produced by this guide is dependent on the competence of the personnel performing it, and the suitability of the equipment and facilities used. Agencies that meet the criteria of Practice D3740 are generally considered capable of competent and objective testing/sampling/inspection/etc. Users of this guide are cautioned that compliance with Practice D3740 does not in itself ensure reliable results. Reliable results depend on many factors; Practice D3740 provides a means of evaluating some of those factors.

5. Significance and Use

5.1 Appropriate purging and sampling equipment must be used to make sure that samples collected from monitoring wells represent the groundwater chemistry of the desired water bearing zone.

5.2 This guide is intended to be a common reference for purging and sampling devices. It can be applied to groundwater quality sampling from monitoring wells used for groundwater contamination evaluation, water supply characterization, and research.

5.3 This guide includes a number of general guidance statements that are not directly related to the operating principles or characteristics of the equipment. These statements are given to assist the user in understanding the application of the equipment, which could ultimately affect the selection process.

6. Apparatus

6.1 The apparatus described in this guide is commonly available from commercial suppliers.

7. Criteria for Selection of Purging and Sampling Devices

7.1 When selecting purging or sampling device(s), or both, a number of criteria must be evaluated as discussed below. Based on these criteria, each device has a unique set of advantages and limitations that define suitability to site-specific applications.

7.2 *Outside Diameter of the Device*—If the well(s) to be purged and sampled is (are) already in place, the initial consideration in selecting a device is whether or not the well(s) will accommodate the device. It is important to consider that the wells may not be plumb, may have constrictions in the casing (that is, at joints), or may contain other obstructions that make the effective inside diameter of the well smaller than the inside diameter of the casing. Alternately, if the monitoring wells are not in place, it may be more prudent to first select a device that meets the requirements of the sampling program and then select the size of the casing to be used in the wells. The smaller the inside diameter of the well, the more limited the selection of devices becomes. The majority of groundwater monitoring wells installed at various types of sites are small-diameter wells, or wells with inside diameters of 100 mm [4 in.] or less. All of the devices described herein will fit into a 100 mm [4 in.] inside diameter well, most can be installed in a 50 mm [2 in.] inside diameter well, and several can be used in wells of 19 mm [0.75 in.] inside diameter or less.

7.3 *Materials and Manufacture*—The choice of materials used in the construction of purging and sampling devices should be based upon knowledge of the geochemical environment and how the materials may interact with the sample via physical, chemical, or biological processes. Materials used in the manufacture of purging and sampling devices and associated tubing, hoses, pipes and support lines (for example, rope, cable or chain) may be a source of bias or error. Materials used should not sorb analytes from samples, desorb previously-sorbed analytes into samples, leach matrix components of the material that could affect analyte concentrations or cause artifacts, or be physically or chemically degraded due to water chemistry. Materials commonly used in the manufacture of sampling devices include rigid polyvinyl chloride (Type I PVC), stainless steel, polytetrafluorethylene (PTFE),[5] polyethylene (PE), polypropylene (PP), flexible polyvinyl chloride (Type II PVC), fluoroelastomers[5] polyvinylidene fluoride (PVDF), and Buna-N, ethylene-propylene diene monomer (EPDM) and silicone rubbers. Studies are available which indicate the relative sorption/desorption rates of these materials, their potential for alteration of the sample chemistry, and their ranking of desirability for use in sampling devices (**4**, **7**, **8**, **9**, **1**, **10**). Extrusions and molded parts made of polymeric materials may contain surface traces of organic extrusion aids or mold release compounds. Also, some formulations of polymeric materials may contain fillers or processing additives that can leach from the material and alter sample quality. Traces of cutting oils, solvents or surface coatings may be present on metallic materials. These should be removed and, once removed, should not affect sample chemistry. It is generally preferable to use materials produced without the use

[4] The boldface numbers in parentheses refer to a list of references at the end of this standard.

[5] PTFE is also commonly known by the trade name Teflon®, which includes other fluoropolymer formulations. Teflon is a registered trademark of E. I. DuPont De Nemours & Company. Fluoroelastomers (FPM, FKM) are commonly known by the trade name Viton®, a registered trademark of DuPont.